Emerald Ash Borer in MD

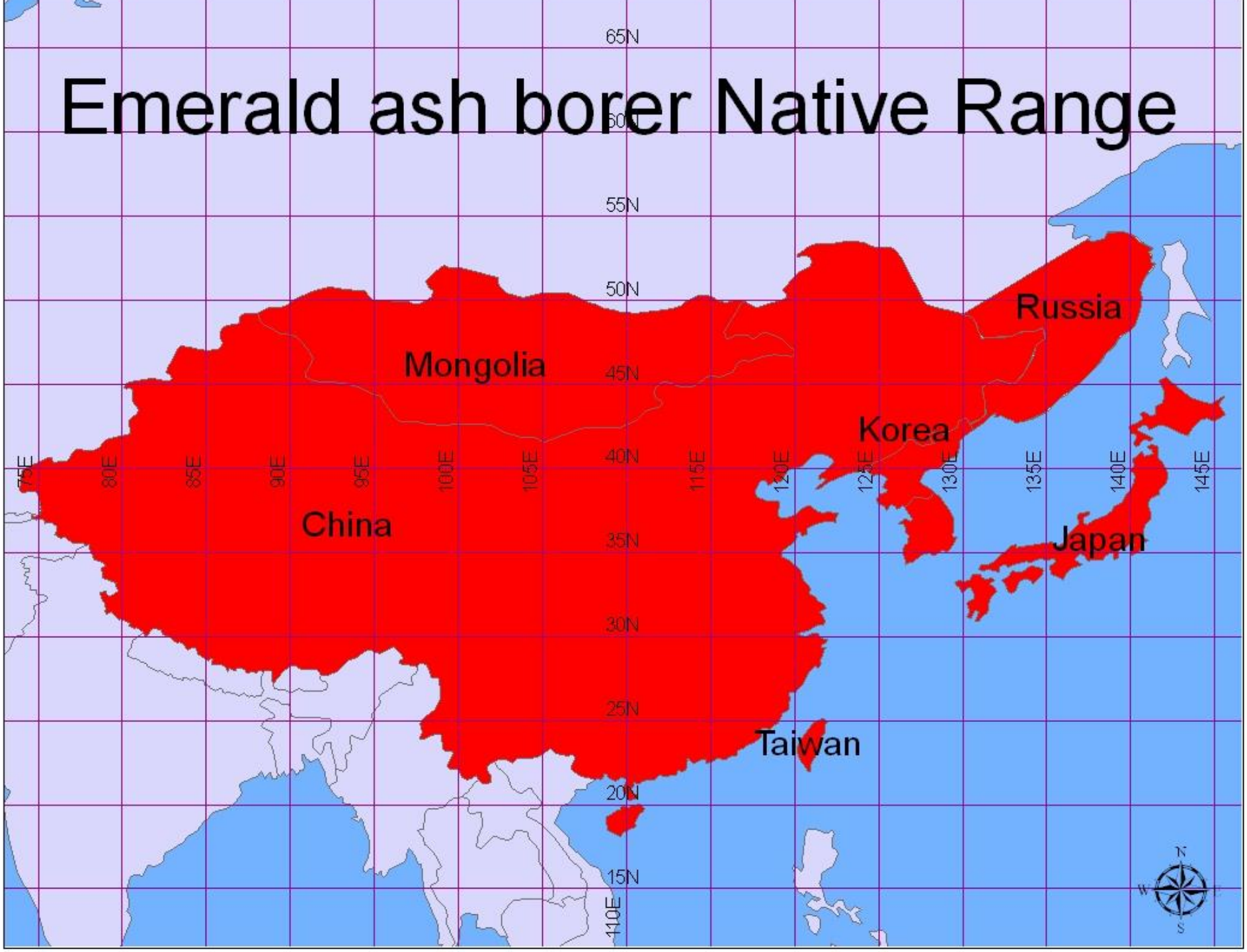
July 29, 2015

Tom Lupp, Entomologist
Forest Pest Management Section
MD Dept Agriculture

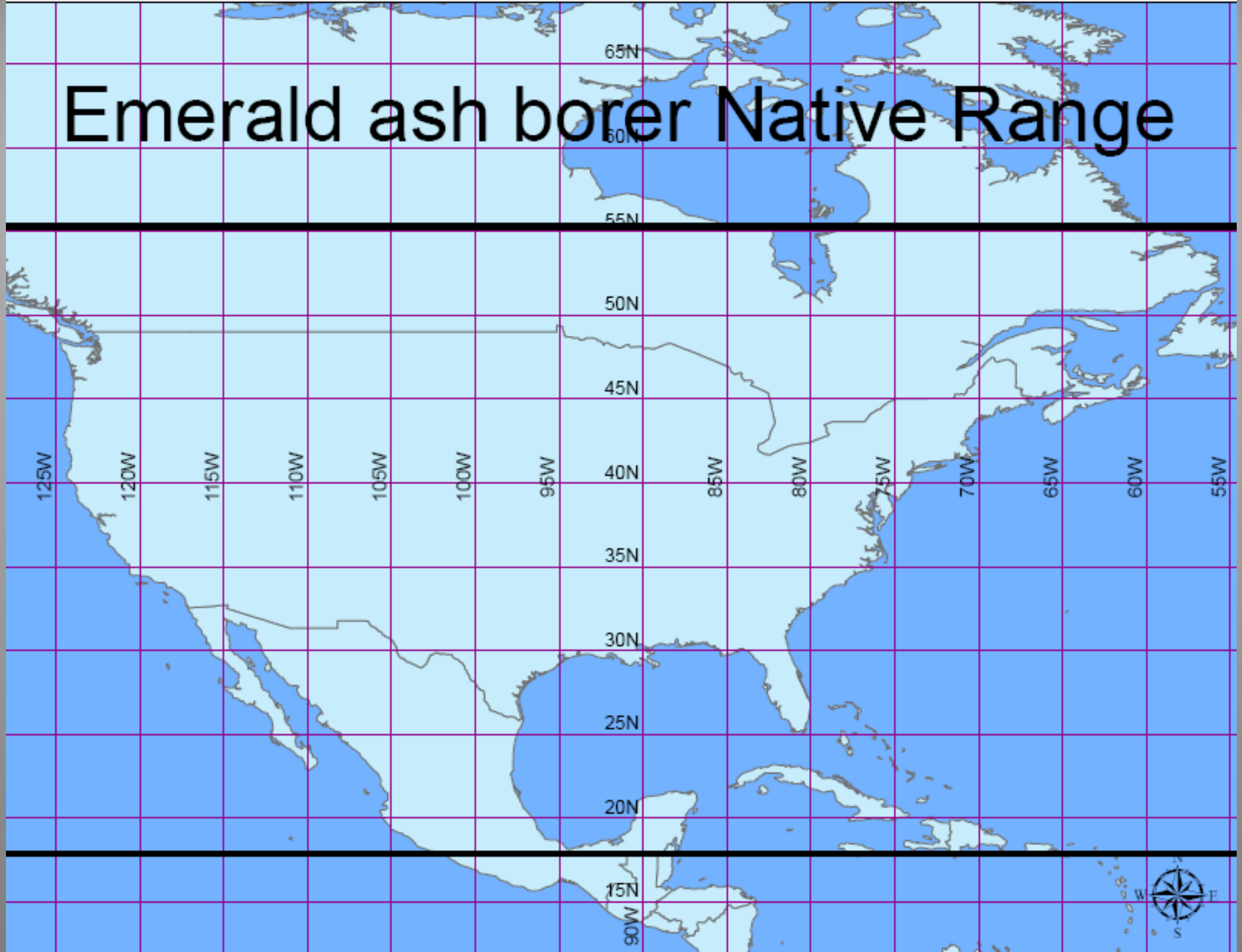
Emerald Ash Borer (EAB)

Agrilus planipennis

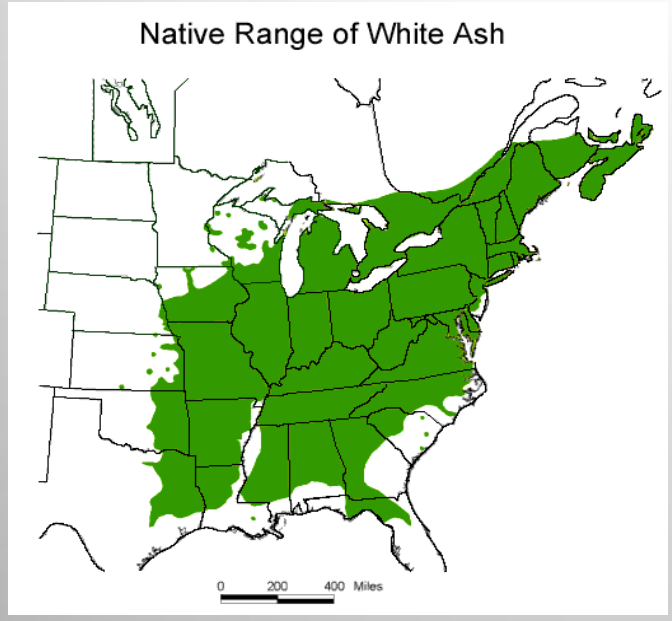
Order: Coleoptera
Family: Buprestidae

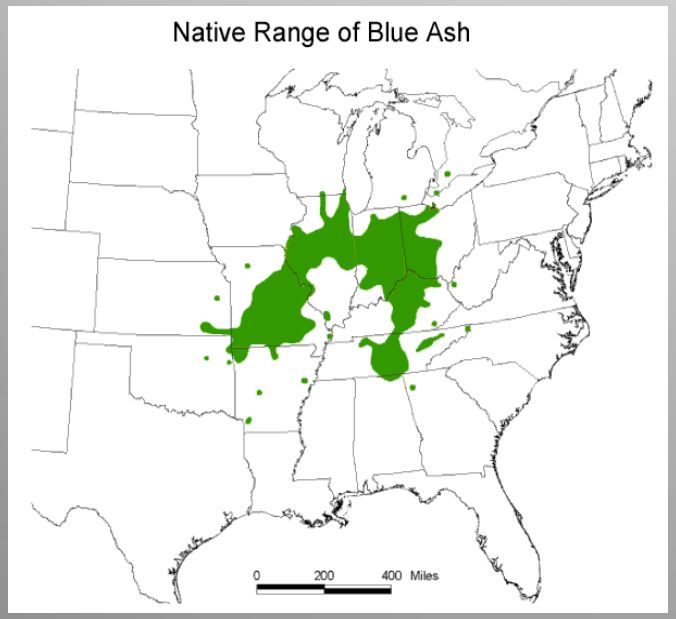

Emerald ash borer Native Range
65N
60N
55N
50N
45N
40N
35N
30N
25N
20N
15N
75E
80E
85E
90E
95E
100E
105E
110E
115E
120E
125E
130E
135E
140E
145E
Russia
Mongolia
Korea
China
Japan
Taiwan
N
W
S

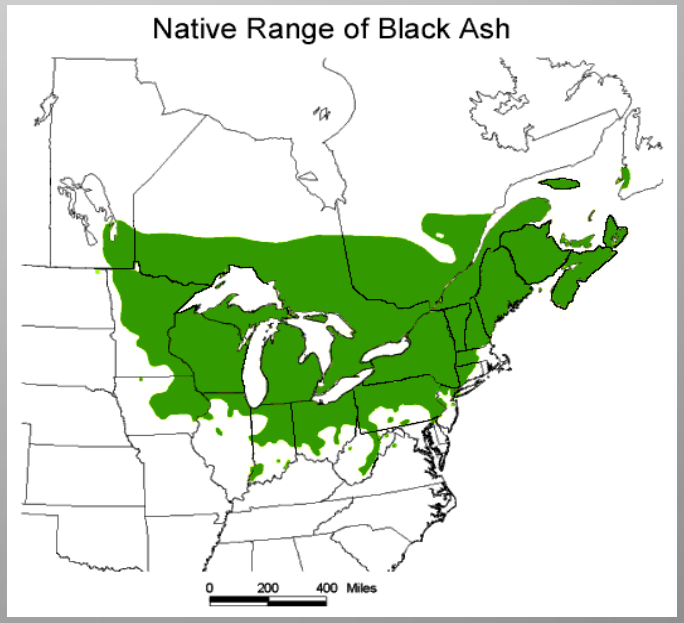
Emerald ash borer Native Range



Distribution of Ash

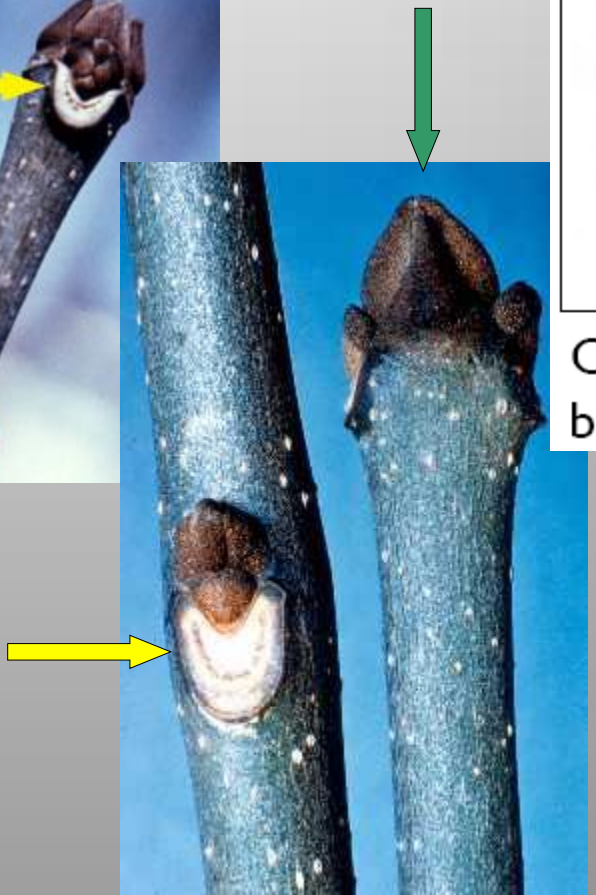


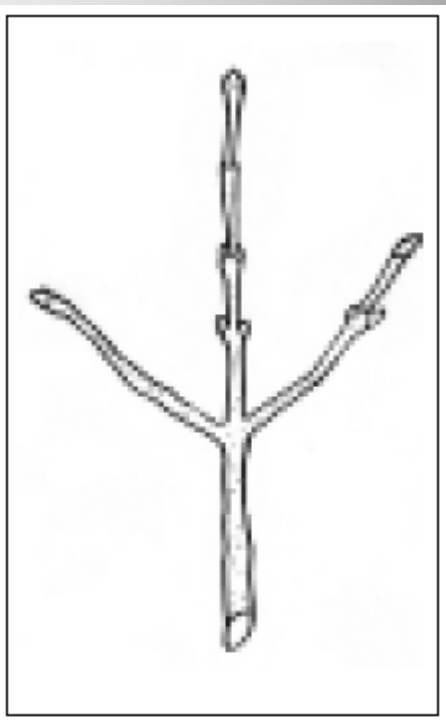




Ash Identification

- Opposite branches and buds
  - Single bud at end of branch
  - Leaf scar U shaped
- 5-9 leaflets





Opposite branching

Ash Identification

Bark on older trees deep with a diamond pattern

Upright form

Mating and Eggs

Larvae (immatures)

Adults

Pupae

Symptoms/Signs of EAB

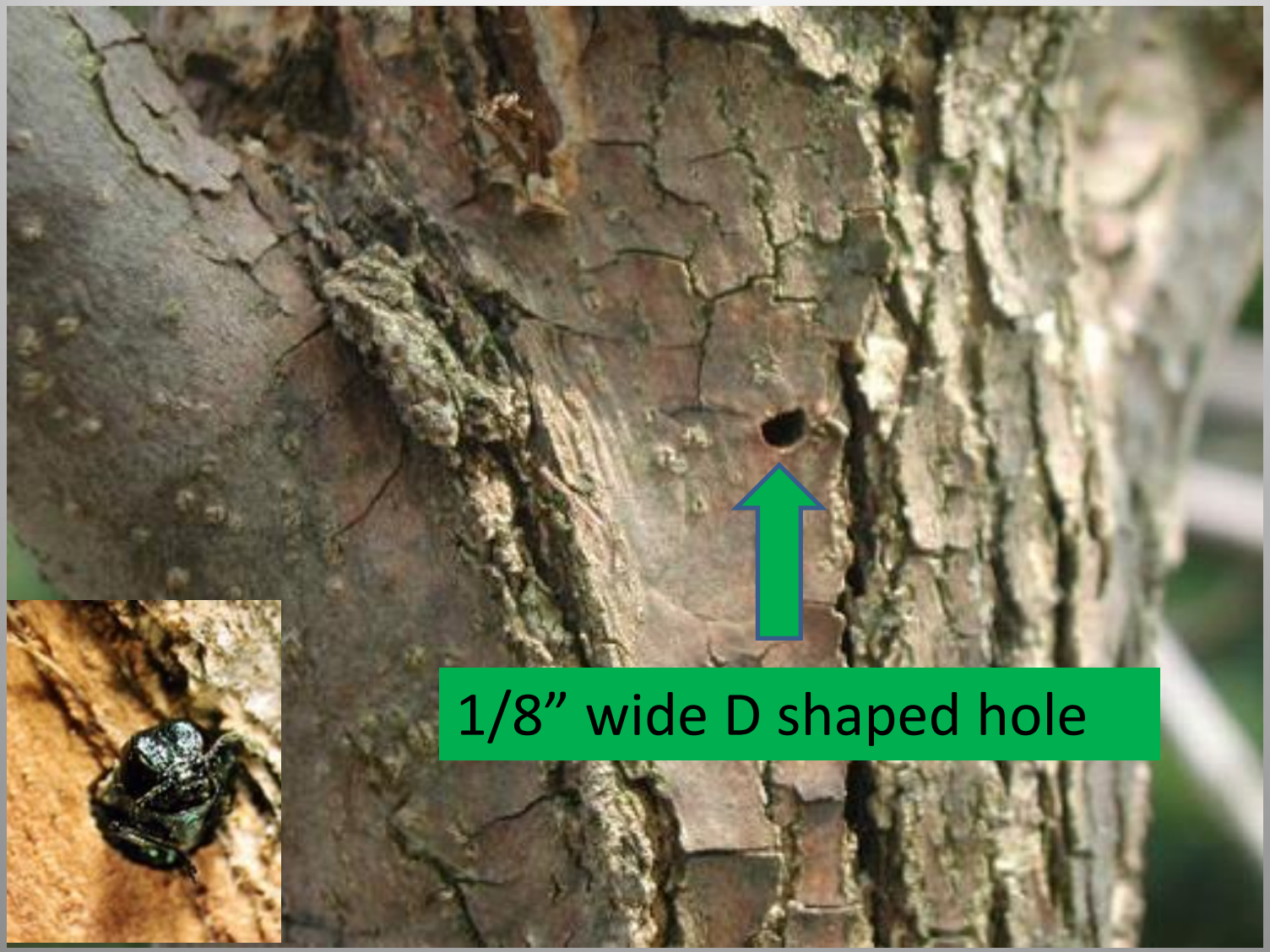
- **Dieback in upper crown.**
- **Suckering (epicormic branching) on the tree's trunk.**

Signs of emerald ash borer

- Vertical splitting.
- “D” shaped exit holes.
- Tunneled galleries underneath bark.

Bark split with galley

D-shaped exit hole



Red bellied woodpeckers most common EAB predator in MD

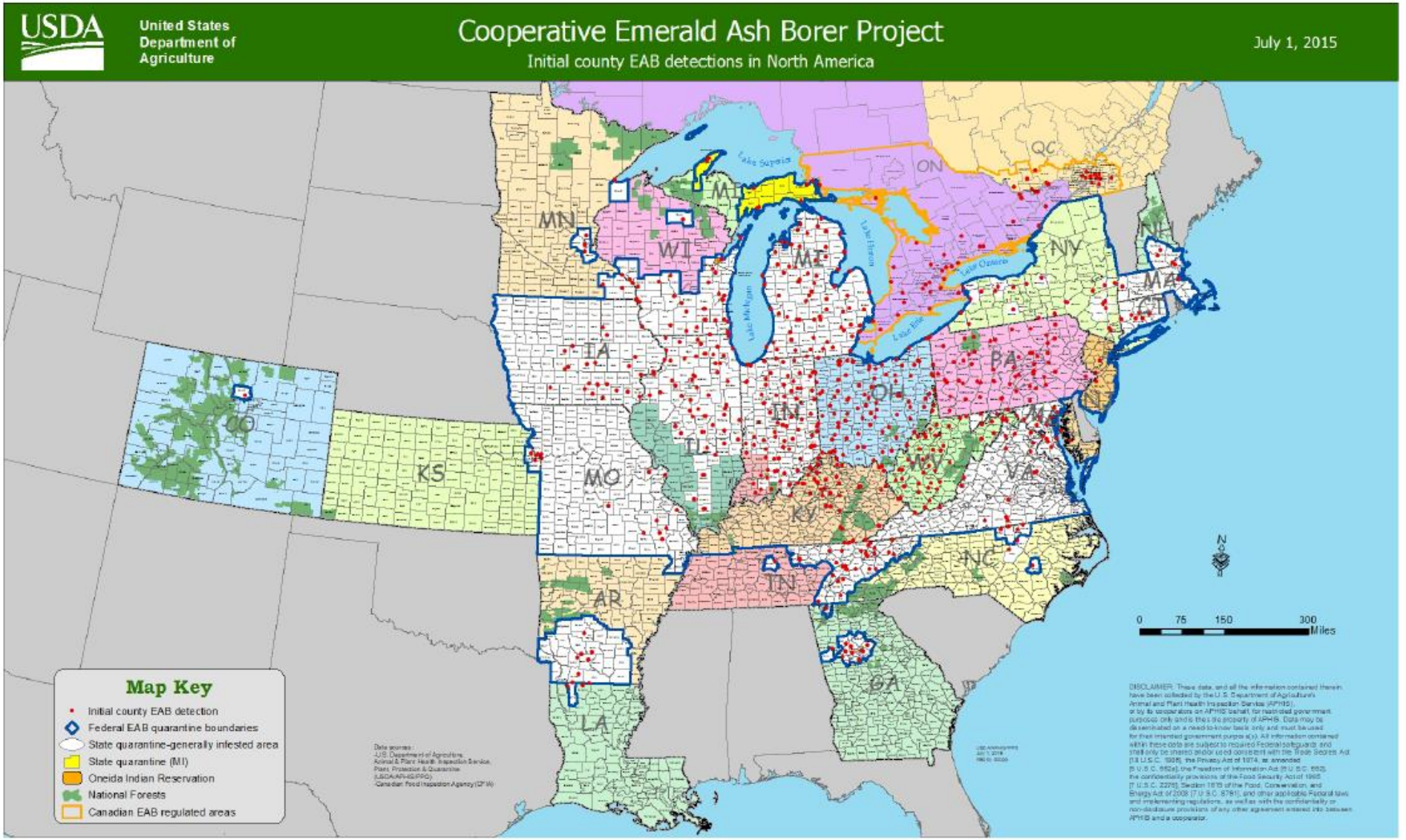
Signs of emerald ash borer feeding

Signs of emerald ash borer

Newly emerged EAB fly to the canopy and start feeding

Ash tree infested with EAB on August 20, 2009

Same tree as previous slide one year later.



Red dots represent the first positive find for EAB in each county.

Emerald Ash Borer

Earliest known emergence dates in MD

- 2008 - May 18
- 2009 – May 12
- 2010 – May 1
- 2011 – May 10
- 2012 – April 20
- 2013 – May 16
- 2014 – May 15
- 2015 – May 10

Average 431 DD 50°F start emerging. Black locust blooming

98% of all beetles trapped are captured

by 1st week of August in MD

EAB Trapping

mid-April – mid-August

VERY STICKY


07 0154 AM

Insects in Minnesota That May Be Confused With Emerald Ash Borer

Jeff Hahn, University of Minnesota Extension
Val Cervenka, Minnesota Department of Natural Resources

PRODUCED BY
UNIVERSITY OF MINNESOTA EXTENSION
extension.umn.edu
dnr.state.mn.us

WITH SUPPORT FROM
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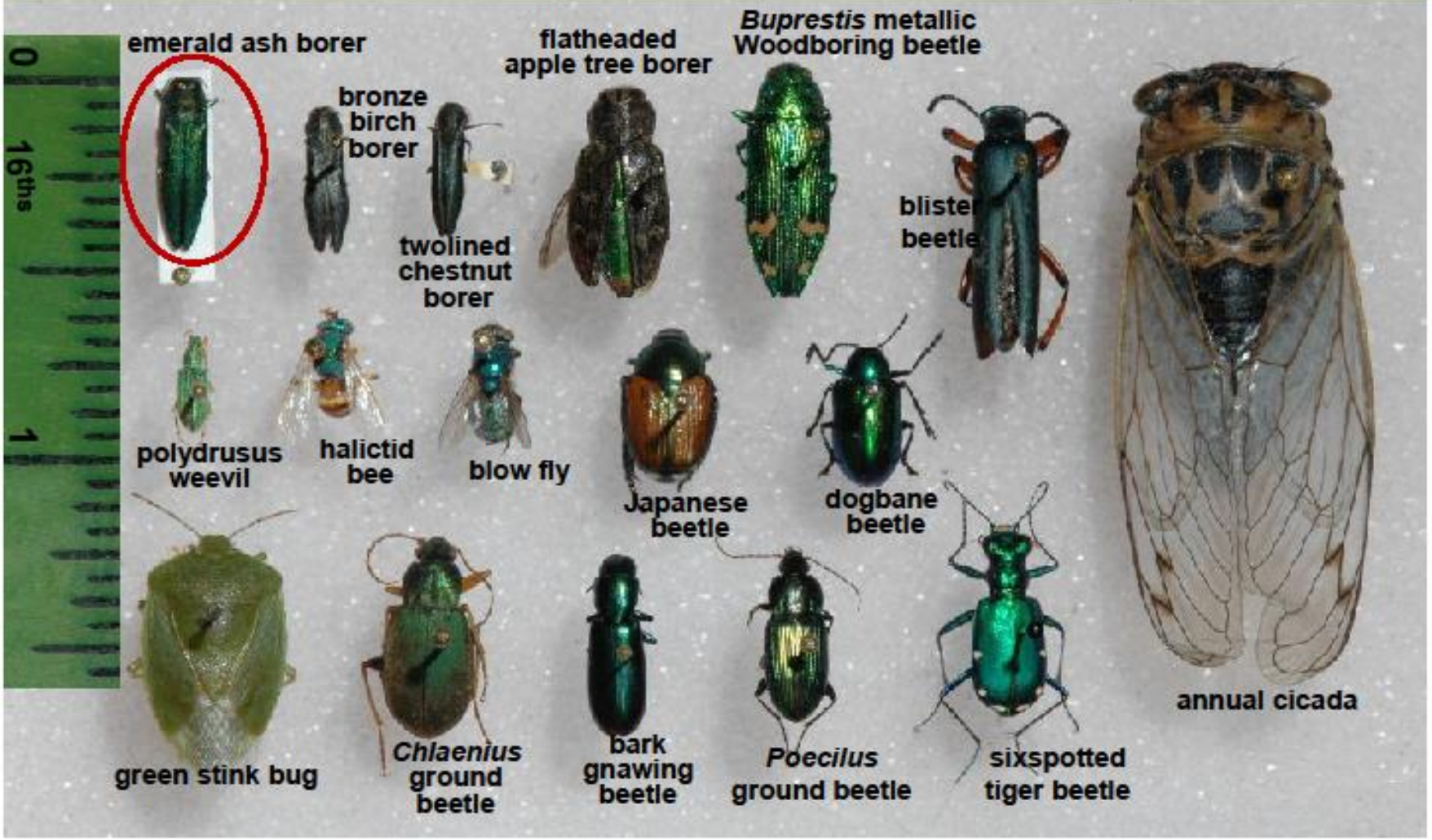


Ash and Banded Ash Clearwing Borers

- Ash Borer moths present in early summer.
- Larvae feed through summer and overwinter as pupae.
- Banded Ash Clearwing moths present in late summer and fall.
- Larvae overwinter as 2nd instar, pupate in summer.
- Look for sawdust like frass and pupal skins protruding from exit holes.
- Crown dieback and epicormic shoots.

Ash Borer

Banded Ash Clearwing

Maryland Emerald Ash Borer Project

2010 Trap Survey

Legend

- ✚ Positive Traps
- ▲ 2010 Trap Locations

2601 Total
33 Positive Traps

GARRETT
ALLEGANY
WASHINGTON
FREDERICK
CARROLL
HARFORD
CECIL
BALTIMORE
BC
KENT
HOWARD
QUEEN ANNES
MONTGOMERY
ANNE ARUNDEL
CAROLINE
TALBOT
PRINCE GEORGES
CALVERT
CHARLES
DORCHESTER
WICOMICO
SAINT MARY'S
WORCESTER
SOMERSET

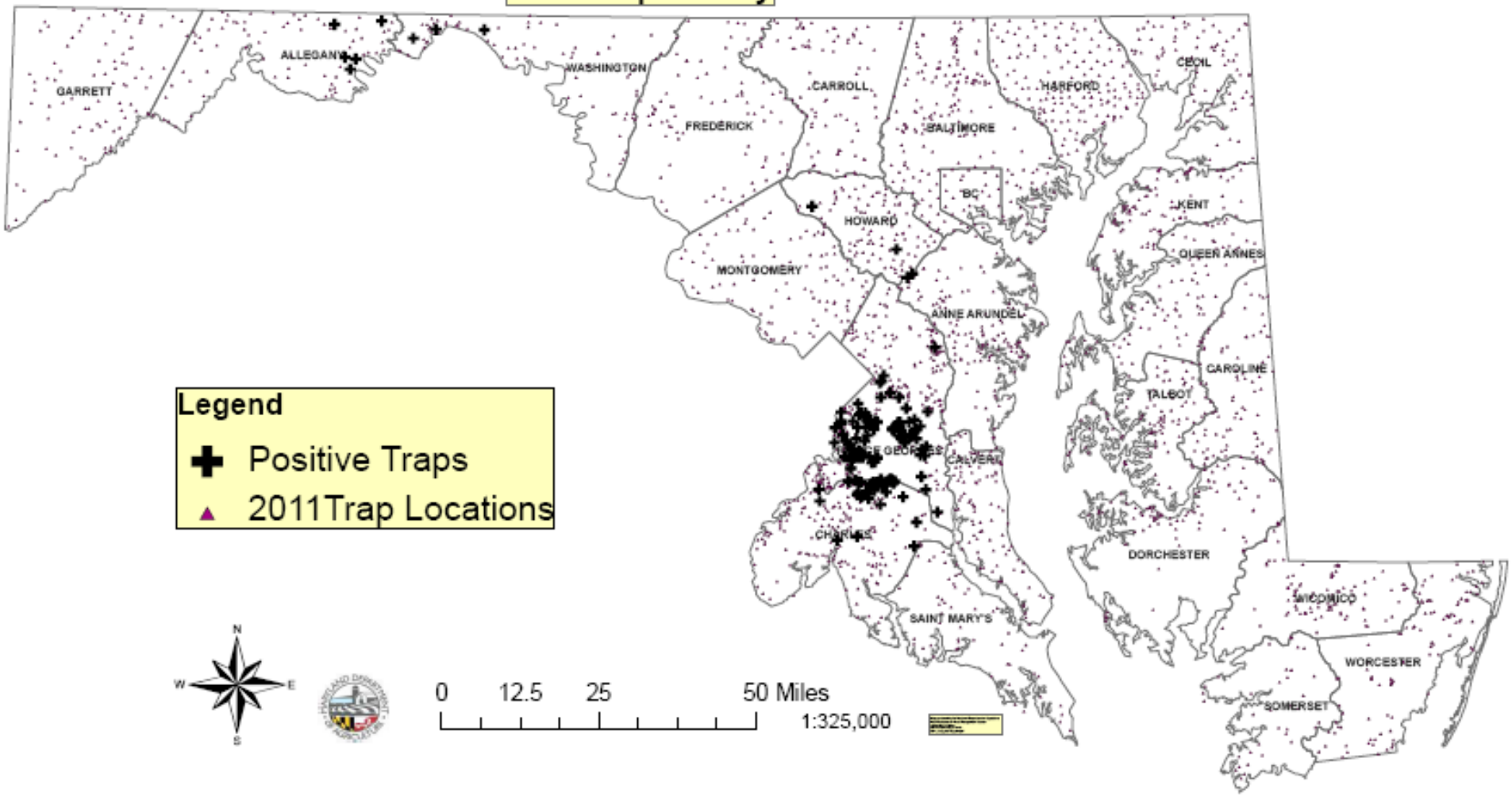
N W E S

0 12.5 25 50 Miles

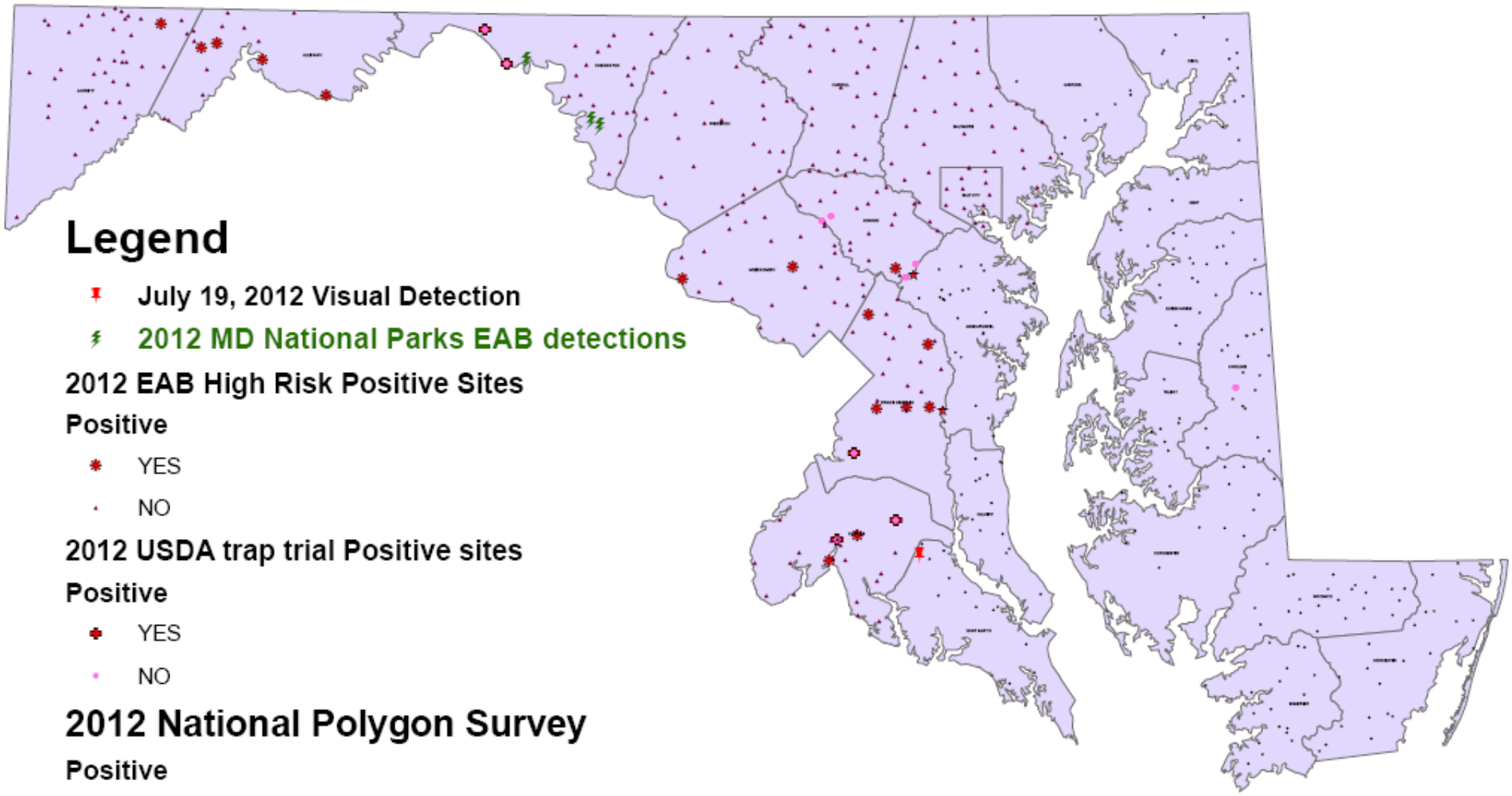
1:325,000

Maryland Emerald Ash Borer Project

2011 Trap Survey



2012 Maryland Emerald Ash Borer Project



Legend

- July 19, 2012 Visual Detection
- 2012 MD National Parks EAB detections

2012 EAB High Risk Positive Sites

Positive

- YES
- NO

2012 USDA trap trial Positive sites

Positive

- YES
- NO

2012 National Polygon Survey

Positive

- YES
- NO

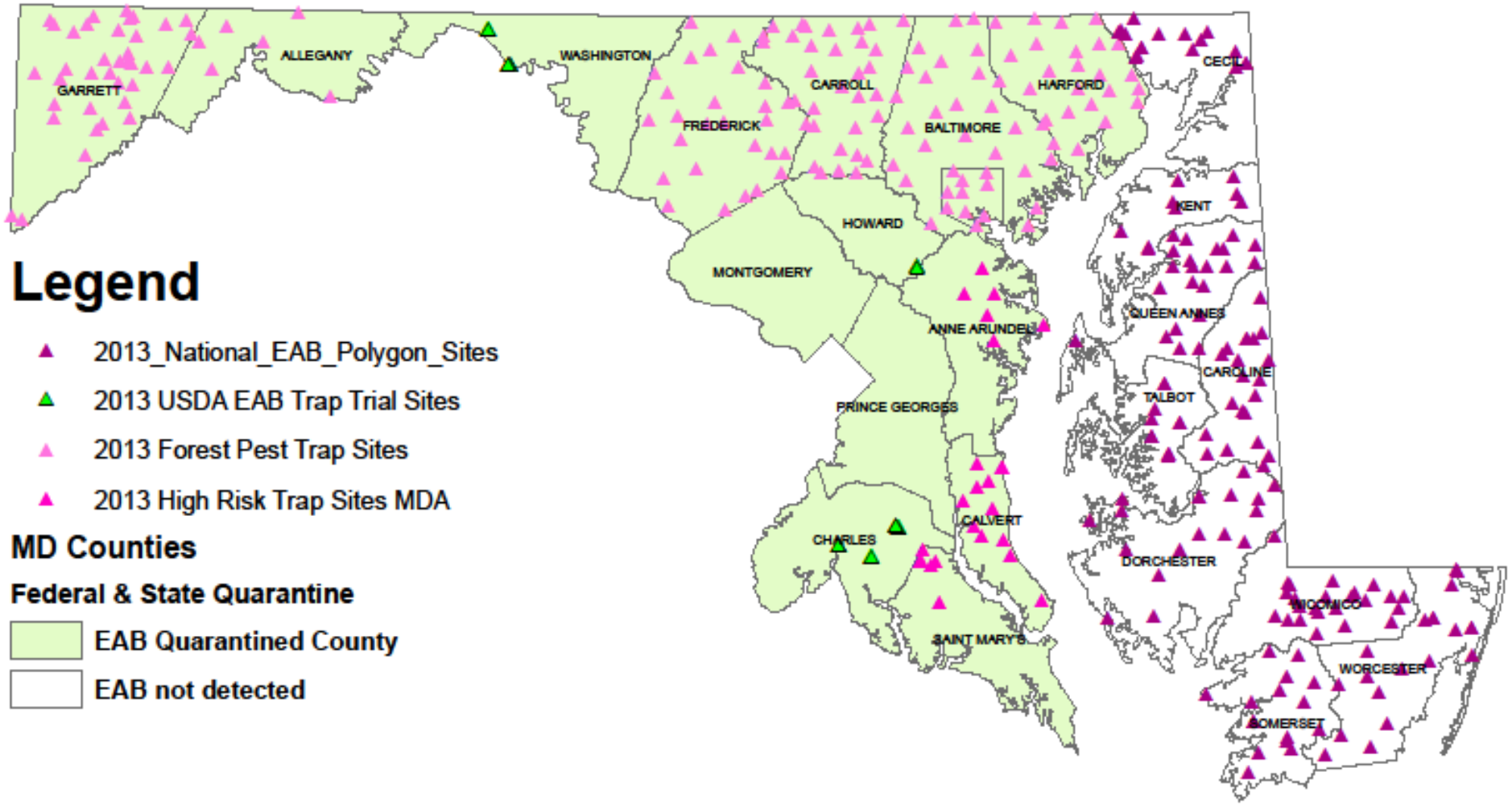
1:325,000

0 12.5 25 50 75 100 Miles

N W E S

MARYLAND DEPARTMENT OF AGRICULTURE

2013 Maryland Emerald Ash Borer Project
National Grid Survey Sites



Maryland Emerald Ash Borer Project
2014 Trap Survey
As of 08/14/2014

Legend

- 2014 MD EAB USDA Grid Survey

2014 PPWM High Risk

EAB Detected?

- No
- Yes

2014 FPM High Risk

EAB Detected?

- No
- Yes

Map produced by the Maryland Department of Agriculture
Plant Protection & Weed Management Section
08/14/2014 D. Bean
2014_MD_Trapping_V2.mxd
2014_MD_EAB_Survey_5.pdf

1:1,443,762

0 10 20 40 60 80
Miles

Maryland Emerald Ash Borer Project
2003 to 2014 Positive Sites

Legend

- 2014 New Positive Trap Sites
- 2013 - 2014 Visual Detections
- 2011 Positive Trees
- 2010 Positive Trees
- 2003-2013 Positive Sites
- DNR Visual Detections
- 2012-2013 NPS Pos Sites

MD Counties

Federal & State Quarantine

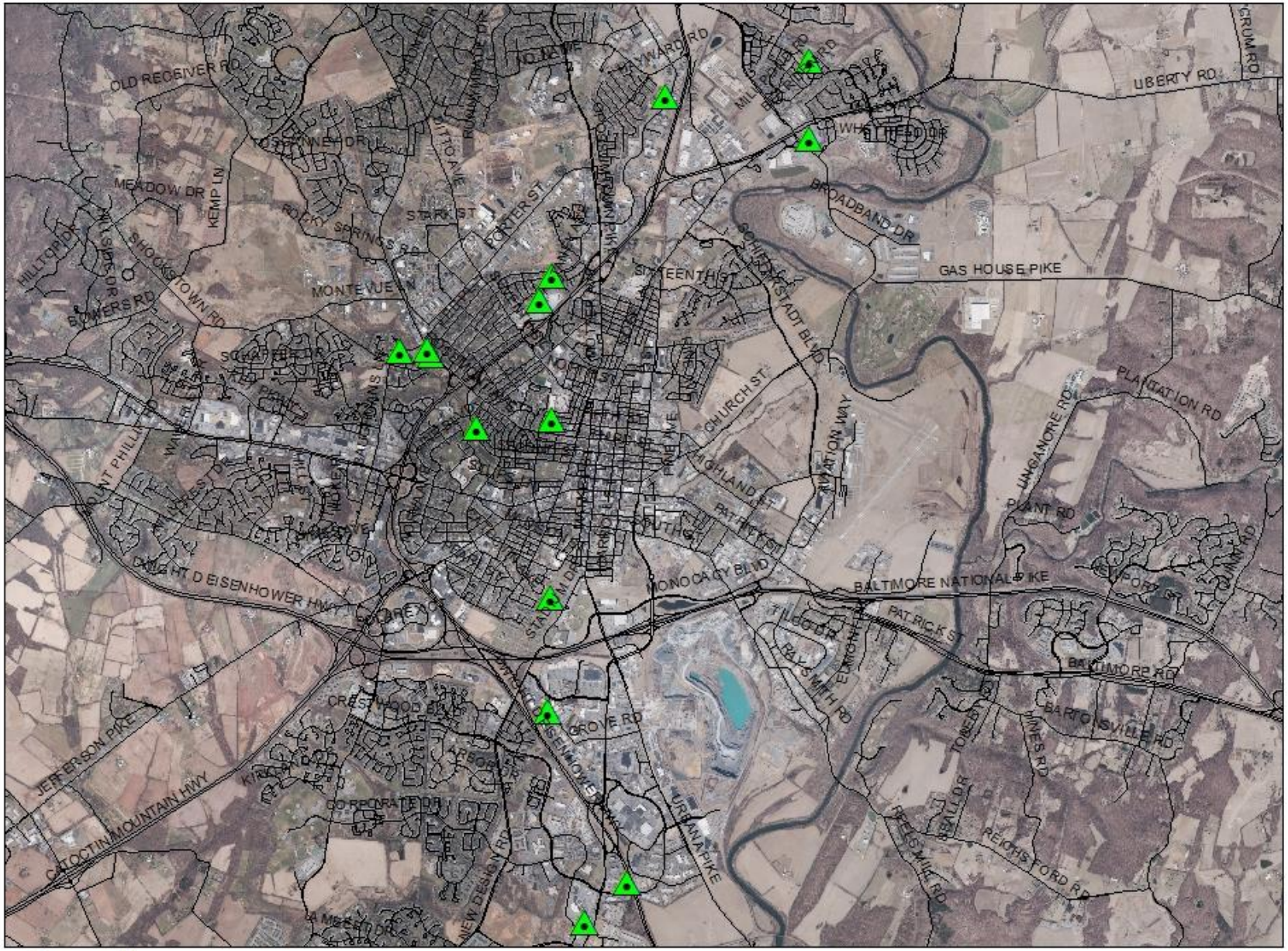
- EAB Quarantined County
- Not Quarantined

1:1,491,840

0 5 10 20 30 40 Miles

Map produced by the Maryland Department of Agriculture
Plant Protection & Weed Management Section
8/14/2014 D Bean
EAB_Historical.mxd

Positive EAB Sites in Frederick City

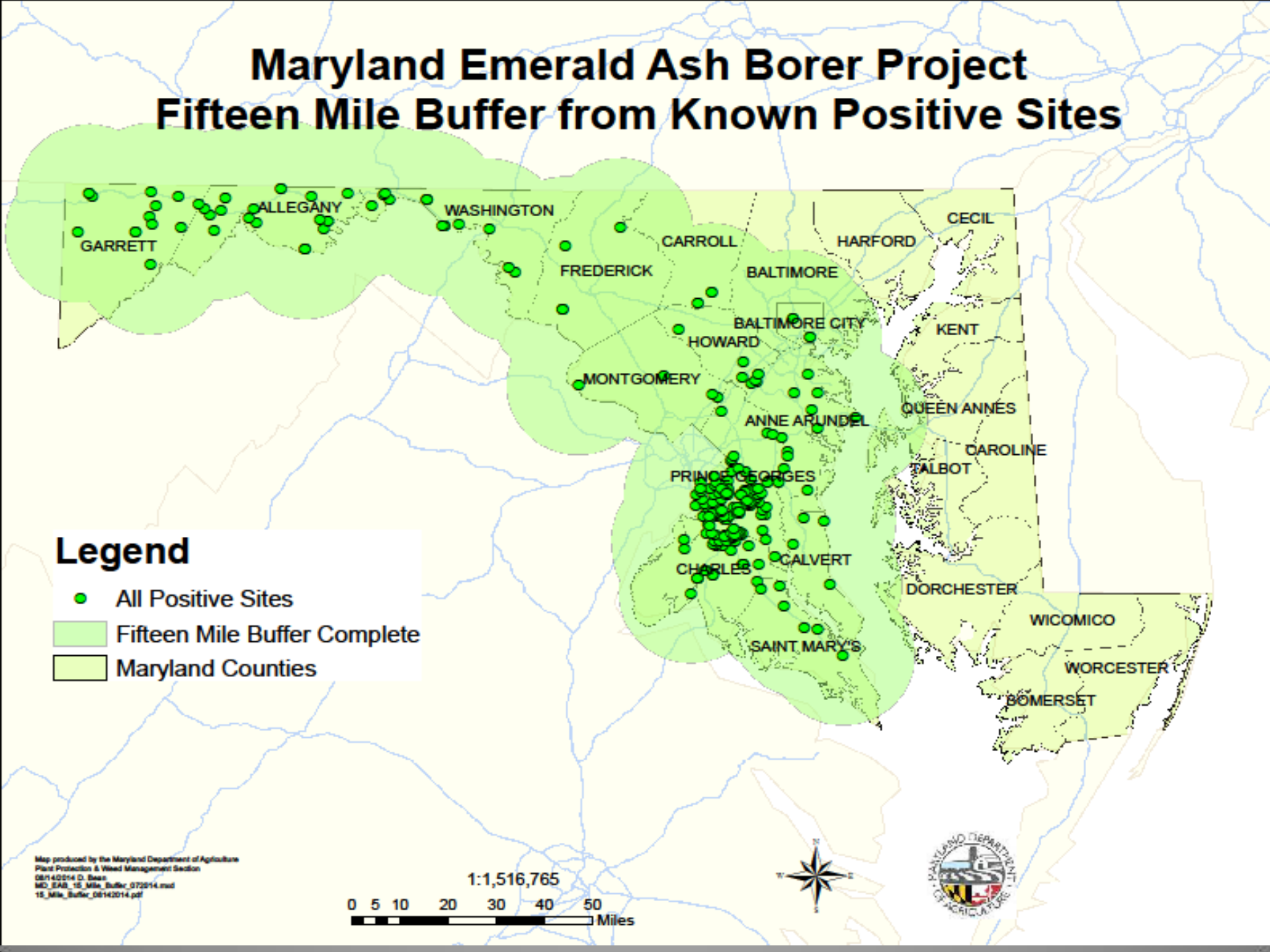


Legend

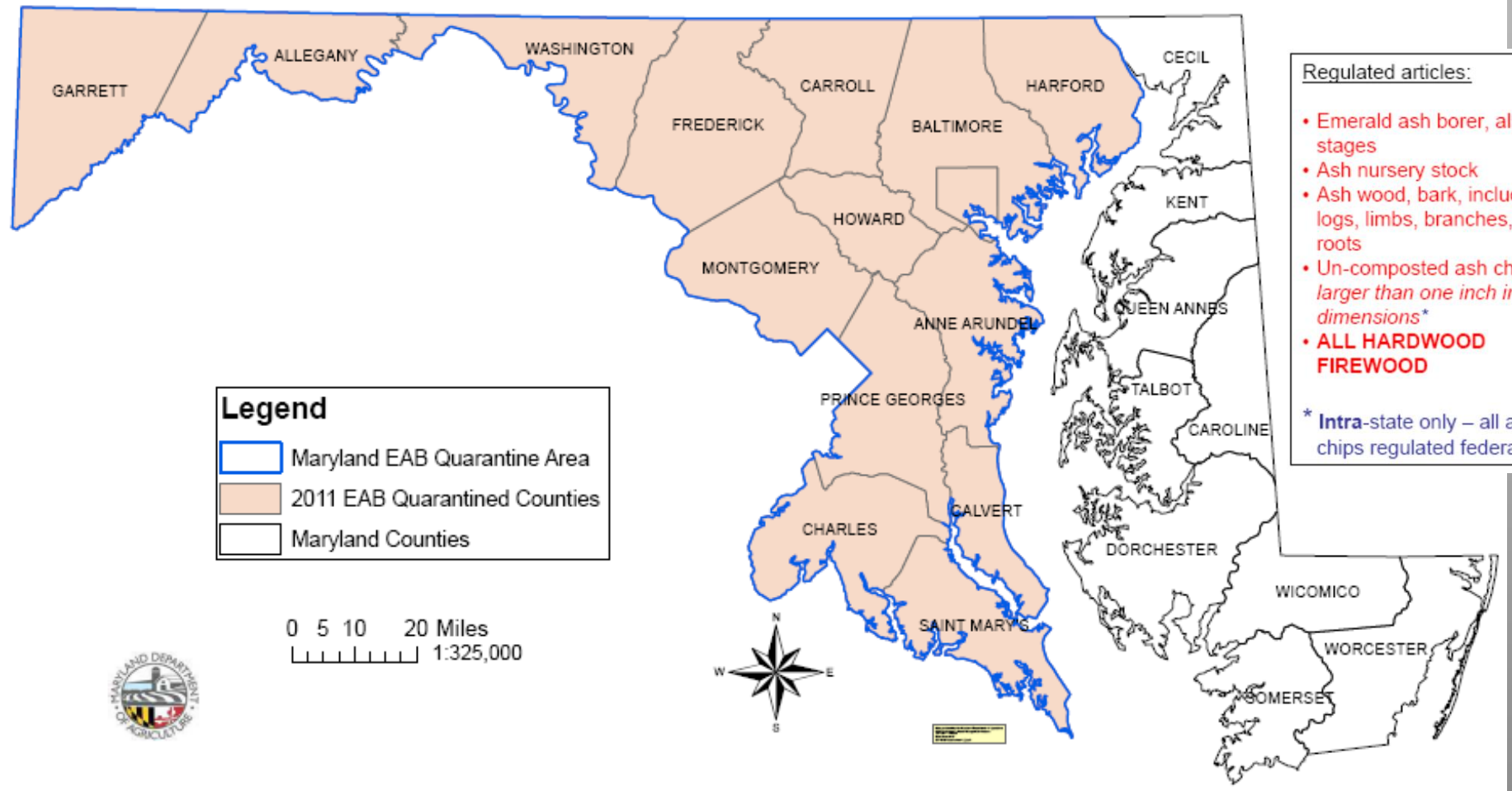
▲ Tree(s) Positive for EAB

0 0.4 0.8 1.6 2.4 3.2 Miles

Maryland Emerald Ash Borer Project
Fifteen Mile Buffer from Known Positive Sites



Maryland Department of Agriculture
Emerald Ash Borer Quarantine Order #11-2

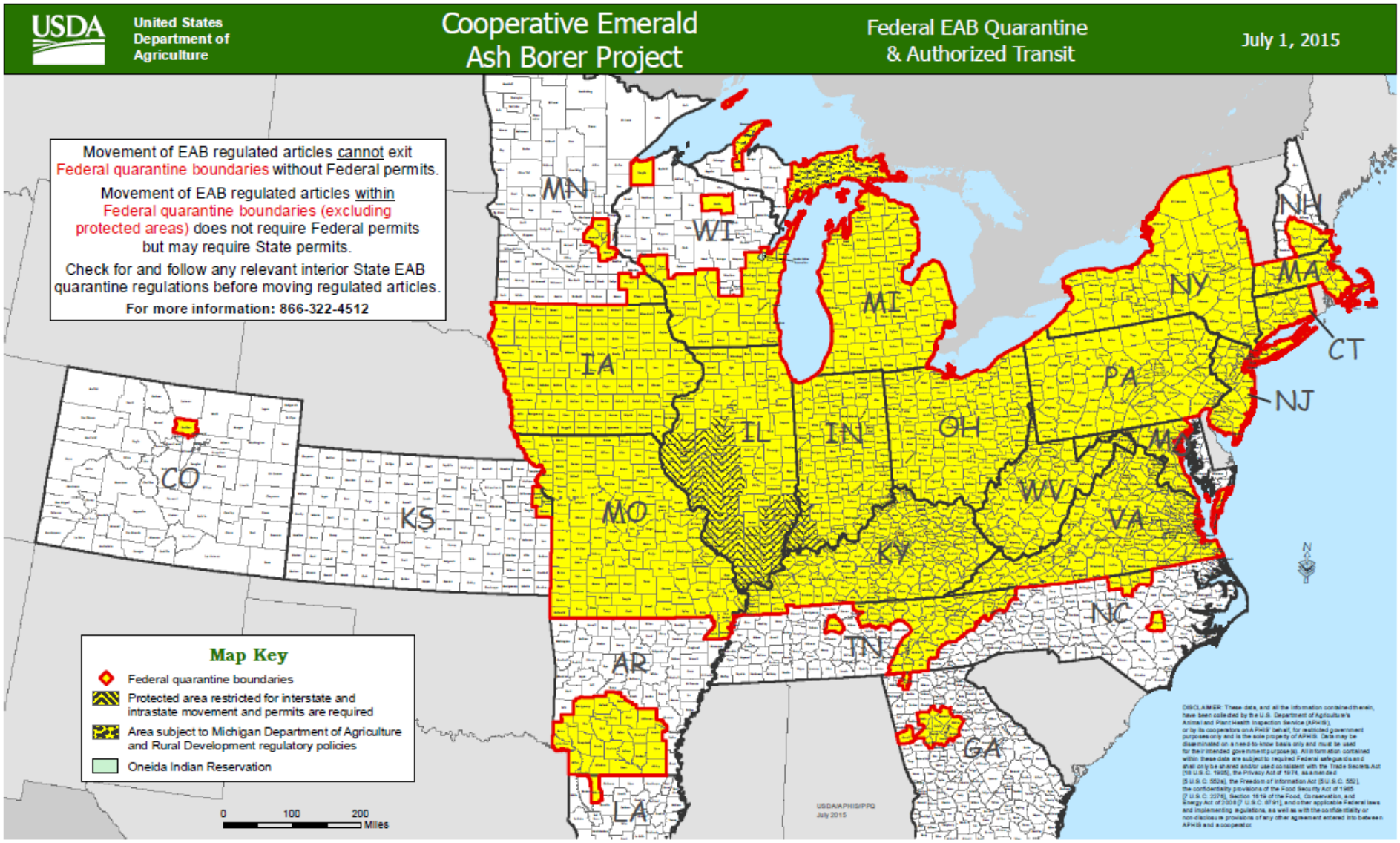


Regulated articles:

- Emerald ash borer, all stages
- Ash nursery stock
- Ash wood, bark, including logs, limbs, branches, roots
- Un-composted ash chips *larger than one inch in two dimensions**
- **ALL HARDWOOD FIREWOOD**

* **Intra**-state only – all ash chips regulated federally

Federal Quarantine – USDA



Rearing EAB in MD

- MDA raises adult EAB beetles to assist in the parasitoid research conducted by USDA, Agricultural Research Services (ARS)
- Raised over 8,000 adults beetles in 2014 for research

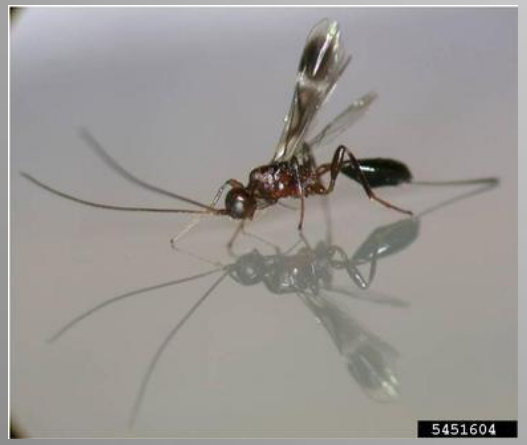
EAB Biocontrol Agents (Parasitic Wasps)

Debbie Miller, USDA Forest Service, Bugwood.org

Oobius agrili

- Tiny wasp
- lays its egg inside an EAB egg.
- Each *Oobius* adult can parasitize up to 62 EAB eggs.
- *Oobius* completes two generations per year.

David Cappaert, MI State Univ., Bugwood.org



Jennifer Ayer, Bugwood.org

Spathius agrili –

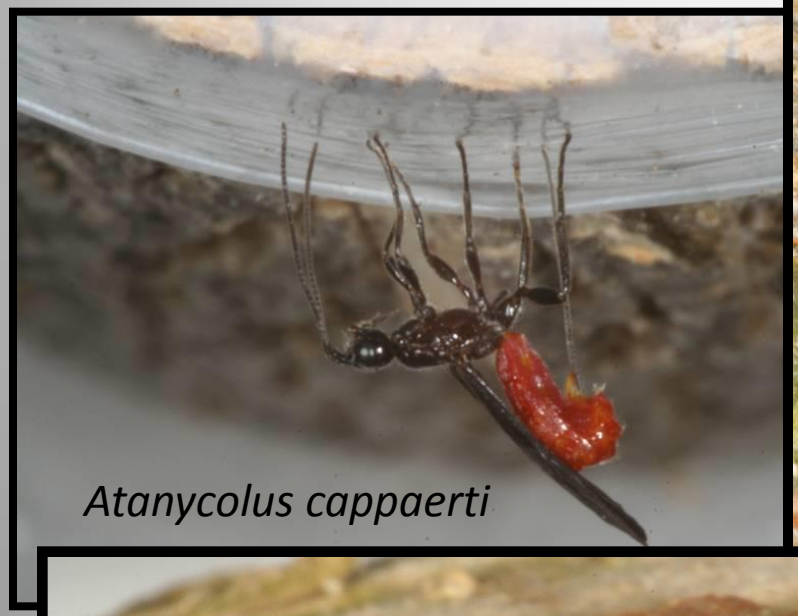
- Largest of the three parasitic wasps (but still very small)
- Lays its eggs on EAB larvae.
- Can lay up to twenty eggs on one EAB larva, where they feed and develop.
- Completes 3-4 generations per year.

Tetrastichus planipennisi

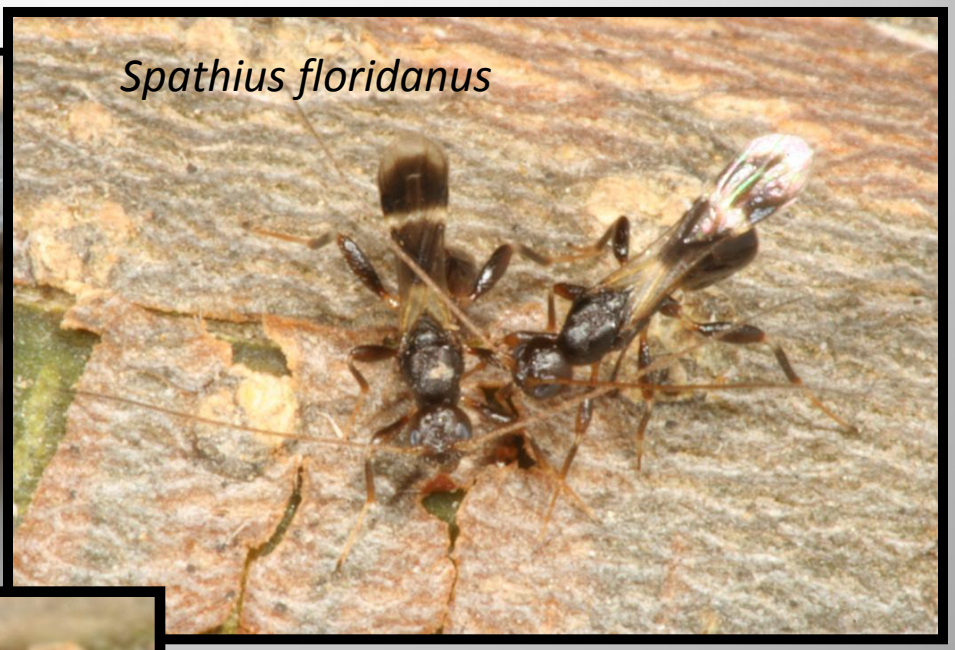
- Small wasp lays its eggs inside EAB larvae
- Larvae grow in the EAB larva, eventually killing it
- *Tetrastichus* can complete four generations a year.

Releases in MD started in 2009.
All parasitoids have been recovered.

Native Parasitoids



Atanycolus cappaerti



Spathius floridanus

Spathius sp.

Phasgonophora sulcata

EAB in MD – The Future

- Monitoring the spread of EAB by continuing to survey in all counties that are negative for EAB
- Parasitoid releases
  - New sites will be added as the infestation moves in to new counties
- Rearing EAB for USDA Agricultural Research Services (ARS) continued parasitoid research
- Continue greenhouse rearing of tropical ash trees


Joe Heller ©2009
GREEN BAY PRESS-GAZ.
HAVE CAMPER WILL TRAVEL
I'M WITH STUPID
EMERALD ASH BORER